The Effect of Addition of Sweet Wood Extract (*Cinnamomum burmanii*) and Saving Time on Fat Levels, FFA Levels and TBA of Brownies Cork Fish (*Ophiocephalus striatus*)

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Abstract: The cork fish is not liked by the community due to the fishy smell or fishy smell of cork, so it is necessary to diversify the processing of cork fish in order to be able to increase the interesting consumption of the community. The process of cork fish has not yet been optimal, so it is necessary to diversify the process of cork fish into a product that has a higher value, both from nutrition and economics so that the potential of cork fish can be utilized optimally, one of which is by making brownies with cinnamon as an antioxidant. The purpose of this study was to determine the effect of the concentration of cinnamon extract on fat content, free fatty acid levels and steamed cork steamed brownies, knowing the effect of shelf life on fat content, free fatty acid levels and steamed cork steamed brownies, knowing the effect of concentration cinnamon extract and shelf life of fat content, free fatty acid levels and TBA of steamed cork brownies. The research method was using the experimental method, the independent variables in this study were cinnamon concentration and shelf life, while the dependent variables were fat content, FFA levels, TBA levels, protein levels, albumin levels and hedonic organoleptic characteristics and scoring including texture, aroma and taste. The use of different cinnamon concentrations is 0%, 2.5%, 5%, and 7.5% affect the fat content, FFA levels and TBA levels of cork steamed brownies. Long shelf life of 0 days, 2 days, 4 days and 6 days affected fat content, FFA levels, TBA levels of cork fish brownies. The best concentration of cinnamon extract and storage time produced the best cork steamed brownies at 2.5% cinnamon concentration with a shelf life of 0 days with fat content 28.18%, FFA content 0.37%, TBA 0.51%, protein content 13. 22 %, and albumin levels of 1.23% while oraganoleptic skoreing texture 3.91, flavor scoring 6.49, aroma scoring 5.04, hedonic texture 5.84, hedonic flavor 6.67 and hedonic aroma 4.59.

Keywords: cork fish, cinnamon, fat, FFA, TBA.

I. INTRODUCTION

Cork fish or haruan fish (*Ophiocephalus striatus*) is a fish belonging to the family channidae. This fish is also known as murrel fish or serpent-headed. At present there are around 30 species of cork fish found in the world, namely 3 species in Africa and the other in Asia. Cork fish distribution is spread it in the fresh waters such as rivers, swamps and lakes. In a country like Malaysia, cork fish is an economically important fish, besides this fish also plays a role in the field of traditional medicine (Ambak et al., 2006).
Cork fish is not liked by the community due to the fishy smell or fishy smell of cork, so it is necessary to diversify the processing of cork fish in order to be able to increase interest in consumption of the community (Ernawati, 2012). According to (Fatmawati and Mardiana, 2014), cork fish processing to date has not been optimal, so it is necessary to diversify cork fish processing into a product that has a higher value, both from nutrition and economics so that the potential of cork fish can be optimally utilized, wrong the other is by making brownies.

According to Machmud et al., (2012), brownies are bakery products included in the cake category. Bakeri products include bread, cookies and cake which are widely consumed products. This product has a lower water content of 10-20% than bread. There are many brownies enriched with protein and carbohydrates, but until now the source of protein from fish is very rarely used in brownies. Fish protein enrichment in brownies can be used as an effort to increase public consumption of fish.
Along with the motto "back to nature", people's interest in using natural ingredients are increasing. One of them is cinnamon. Processed cinnamon products can be found in various forms such as powder, essential oil, and oleoresin. Most of the compounds contained in cinnamon bark are essential oils. Essential oils can be used in the food, beverage, pharmaceutical, flavor, dye and other industries. The chemical content of cinnamon is able to provide a distinctive flavor and aroma (Anggraini et al., 2015).

Compounds that are widely known to counteract free radicals are antioxidants. One of the plants known to contain compounds with very strong antioxidant activity is cinnamon. Cinnamaldehyde compounds derived from phenol in cinnamon are one of the antioxidants that can effectively fight free radicals including superperoxide and hydroxy-radical anions, as well as other free radicals (Mutiara et al., 2015). Based on these conditions, a study was conducted on the effect of increasing the concentration of

cinnamon extract and shelf life on fat content, levels of FFA and TBA steamed fish cork brownies, so that it is expected to provide information to the public about traditional spices (cinnamon) to extend the shelf life of brownies

II. MATERIALS AND METHODS

2.1 Material

The material used in the study consisted of three parts, namely materials for making cork fish surimi, ingredients for making cork fish brownies, and chemical analysis. The ingredients for making surimi are cork, salt and water. Materials for making cork fish brownies consist of wheat flour, eggs, granulated sugar, vanilla, salt, ovalet, chocolate powder, margarine, chocolate bars and bulk ice. Meanwhile, the material used in chemical analysis is concentrated H2SO4, kjeldahl tablets, aquades, pp indicators, concentrated NaOH, H3BO3, MO indicators, H2SO4, succinate buffer, cresol green bromine, Bij 53, and aquadest.

2.2 Methods

This research is using experimental method. Experiments are studies conducted by manipulating the object of research. Experimental research is an observation under artificial conditions where the condition is made and arranged by the researcher. However, this does not mean that this approach cannot be used in social research, including educational research. Experimental research is a special form of investigation that is used to determine any variables and how the relationship between one another

2.3 Analysis Lemak levels

Analysis of fat content according to Legowo et., Al. (2007), first took the sample and weighed ± 1 g for the finely dried sample or ± 1.5 for the wet sample (Weight A). Place the sample that has been weighed in the middle of the filter paper. After the sample is wrapped in filter paper, then heat the sample into the oven with a temperature between 100-1050 C to a constant weight as in determining the water content. Take the oven and enter the sample into the desiccator for ± 15 minutes, then weigh as weight B. Put the sample into the Soxhlet extraction tool. Then enter the liquid pearut liquid into the extraction tool as much as ± 2.5 - 3 times the volume of extraction flask that has been filled with samples. Install the condenser properly. Heating flask is connected with a heater (enter into a water bath with a temperature of ± 600 C. Open the water tap, do the extraction process for at least 6 hours. After the extraction process has been finished for 66 hours turn off the heating source and remove the sample from the condenser. Air ± 30 minutes open air, dry the sample with an oven ± 1 hour and then enter it into the desiccator ± 15 minutes, followed by weighing (weight C) Analysis of the concentration can be seen in Appendix X. Calculation of fat content can be done as below:

Crude Fat Level = $\frac{WeightB - WeightC}{BeratWeightA}$ X 100 %

2.4 Analysis Free Fatty Acid (FFA)

Acid numbers show the amount of free fatty acids contained in an oil or fat. Acid numbers are expressed as the amount of milligrams of NaOH needed to neutralize free fatty acids contained in one gram of fat or oil. The working scheme of the analysis of free fatty acid levels, among others, the material used must be in the form of liquid added 50 ml of alcohol and 2 ml of phenolphthalein indicator then titrated with 0.1 N NaOH solution until pink and then calculate% FFA or acid number (Sudarmadji , 2007).

The acid number = $\frac{ml\ NaOH\ x\ N\ NaOH\ x\ BM\ NaOH}{w\ sampel\ (gram)\ x\ 1000}$ x 100

2.5 Method Thiobarbituric Acid (TBA)

A total of 10 g of sample, put into the grout, added 50 ml of distilled water and crushed for 2 minutes. Samples were transferred quantitatively into a chili distillation flask washed with distilled water and ± 2.5 ml of 4M HCl was added until the pH was 1.5. Then the solution was distilled with 10 minutes of high heating so that 50 ml of distillate was obtained. Take 5 ml of the distillate solution into a closed test tube, then add 5 ml of TBA reagent and heat it for 35 minutes in boiling water. Made blank using 5 ml of distilled water and 5 ml of reagent. The reaction tube was cooled to hear cold water for 10 minutes. Then the absorbance (D) is measured at a wavelength of 528 nm with a blank solution as a zero point. Cell samples of 1 cm in diameter are used. calculated as TBA, expressed in mg of malonaldehyde per kg sample (Harikedua, 2012) According to Azizah et al. (2016), the determination of thiobarbiturate acid numbers can use the following formula: Number of TBA =
3 Sample weight (gram) A x 7.8 Information:
A = Absorbance at 528 nm
7.8 = Numbers TBA mg malonaldehyde / Kg sample
3 = iodine is the degree of unsaturation of oil / fat

2.6 Analysis Protein Levels

The principle of protein content analysis according to Legowo et al., (2007) with the kjeldahl method is to test the amount of protein empirically based on the amount of N in food. After oxidation, ammonia (the result of conversion of the N compound) reacts with acid and becomes ammonium sulfate. Under alkaline conditions, ammonia is evaporated and then captured with acidic solution.

The amount of N is determined by titrating HCl or NaOH. The kjeldahl method has three stages, namely destruction, distillation and titration. As for calculating the percentage of N by using the formula below:

$$\% N = \frac{HCl\ (sample\text{-}blangko)}{sampleweightl(g)x\ 1000} \text{ x B}$$

Information : B = Normality of HCl 14.008 100%

2.7 Analysis of Albumin Levels (Bromol Cresol Green Method)

Analysis of albumin levels according to Rusli et al., (2006) as follows: first prepared 2 ml of sample added with 8 ml of biuret reagent, then shaken. After that it was heated at 370C for 10 minutes. Then cool and then measure with electronic 20 with a waveform of 550 nm and record the absorbance. Then calculated by the formula:

$$ppm = \frac{absorbance\ sample}{0{,}0000526\ A}$$

$$\% = \frac{ppm\ x\ 25}{g\ samplex10^{6}} x\ 100\%$$

Making Biuret reagents:
0.1500 g of CuSO4.5H2O + 25 ml of distilled water
0.6000 g Na K-tartate + 25 ml aquades
Mixed reagents 1 and 2 were added with 30 ml of 10% NaOH, stirring and then diluting to 100 ml of the solution. Beat until homogeneous.

III. RESULT AND DISCUSSION

3.1 Phytochemical Cinnamon Extract

Phytochemical tests were carried out to determine the bioactive compounds qualitatively. In this study phytochemical testing of samples was conducted to determine the presence or absence of flavonoids and phenolic compounds in cinnamon extract

Table 1. phytochemical results in Cinnamon Extract

Bioactive Components	Test results	Information
Flavonoid	+	The amyl alcohol layer is red
Fenolik	+	There is green
Tanin	+	It is formed in dark red
Saponin	-	Color changes from red to blue occur

Source: Fishery Product Engineering Laboratory, Faculty of Fisheries and Marine Sciences, Brawijaya University, 2018

3.2 Fat levels

Based on the results of diversity analysis showed that the treatment of different cinnamon concentrations significantly affected the fat content of cork fish brownies. The shelf life has a significant effect on the fat content of cork fish brownies. Then the interaction between the concentration of cinnamon and the shelf life of cork fish brownies did not affect fat content. The highest fat content was obtained at the concentration of cinnamon 0% and the shelf life of 6 days with a value of 36.70%. While the lowest fat content was obtained at 7.5% long cinnamon concentration with a shelf life of 0 days with a value of 22.25%. This is presumably because more and more concentrations of cinnamon can inhibit the occurrence of fat damage. The statement was supported by Arbi et al., (2016), the content of cinnamon which has essential oils in cinnamon containing flavonoids which can reduce hydroxyl radicals, superperoxide and peroxide radicals, so that it can inhibit oxidation and can neutralize free radicals by giving one electrons to free radicals, so they become non-radical.

3.3 FFA levels

Based on the results of diversity analysis showed that the treatment of different cinnamon concentrations significantly affected the FFA levels of cork fish brownies. Long shelf life significantly affected FFA levels of cork fish brownies. Based on diversity analysis shows that the interaction of different concentration treatments and shelf life has a significant effect on FFA levels of cork fish brownies. The highest FFA level was obtained at 0% treatment of cinnamon concentration with a 6-day shelf life with a value of 1.28%. While the lowest FFA levels were obtained at a concentration of 7.5% with a shelf life of 0 days with a value of 0.09%. Free fatty acids begin to form due to oxidation with the outside environment and handlers in the process of making these

brownies. During fat storage there will be flavor and flavor changes accompanied by the formation of unwanted components and marked by the appearance of a rancid odor, also influenced by the state of fat storage environment, namely RH (air humidity) storage space, temperature (temperature), ventilation, pressure and transportation problems. The properties and resistance of fat to damage depends on the constituent components, especially the fatty acid content. Nurhasnawati et al., (2015), that free fatty acids are formed due to the process of oxidation, hydrolysis of enzymes during processing and storage. When storage is open, it can come into contact with air, temperature and dirt. FFA damage will affect the quality and nutritional value of food ingredients

3.4 TBA levels

Based on the results of the diversity analysis showed that the treatment of cinnamon concentration was different significantly affected the levels of TBA of cork fish brownies. Based on diversity analysis shows that the length of shelf life treatment significantly affects the levels of TBA cork fish brownies. The interaction between cinnamon concentration and shelf life of cork fish brownies affected the TBA level. The highest TBA concentration was 0% cinnamon concentration with a shelf life of 6 days with a value of 1.35%. While the lowest TBA level in treatment (A4B1) 7.5% cinnamon with 0 days shelf life with a value of 0.21%. The higher the concentration of cinnamon can inhibit the destruction of the value of TBA and the length of shelf life affects the quality of TBA. This is reinforced by (Christie et al., 2016), testing the shelf life of brownies using the TBA test shows that the higher the value of TBA means the lower the quality of brownies. Products with high fat content such as fish are said to be good if they have a TBA value of less than 3 mg malonaldehyde / kg sample

3.5 Protein Levels

Based on the results of the analysis of diversity shows that the treatment of different concentrations does not significantly affect the levels of protein in cork fish brownies. Based on the results of diversity analysis showed that the shelf life of the treatment had a significant effect on the protein content of cork fish brownies. Based on diversity analysis shows that the interaction of treatment of different cinnamon concentrations and shelf life does not affect the levels of protein in cork fish brownies. The highest protein content was obtained at 5% cinnamon concentration with a shelf life of 0 days with a value of 14.23%. While the lowest protein content was obtained at a 7.5% concentration treatment with a shelf life of 6 days with a value of 4.23%. Protein levels experience setbacks during storage, strengthened by Harris and Fadli (2013), there are factors that can affect the decline in food product quality. There are six main factors that result in a decrease in quality or damage to food products, namely mass oxygen, water vapor, light, microorganisms, compression or slamming and toxic chemicals or off flavor. These factors can lead to further deterioration, such as lipid oxidation, vitamin damage, protein damage, odor changes, browning reactions, changes in organoleptic elements and the possibility of toxic formation

3.7 Albumin levels

Based on the results of diversity analysis showed that the treatment of different cinnamon concentrations did not significantly affect the levels of cork fish albumin brownies. Based on the results of diversity analysis showed that the shelf life has a significant effect on the levels of cork fish albumin brownies. Based on diversity analysis showed that the interaction of the treatment of different cinnamon concentrations and shelf life did not affect the levels of cork fish albumin brownies (P> 0.05). The highest albumin level was obtained in the treatment (A4B1) concentration of 7.5% cinnamon with a shelf life of 0 days with a value of 1.26%. While the lowest albumin level in treatment (A3B4) brownies at a concentration of 5% with a shelf life of 6 days which has a value of 0.24

3.8 LCMS

The LCMS graph of cork steamed brownies can be seen in Figure 1.

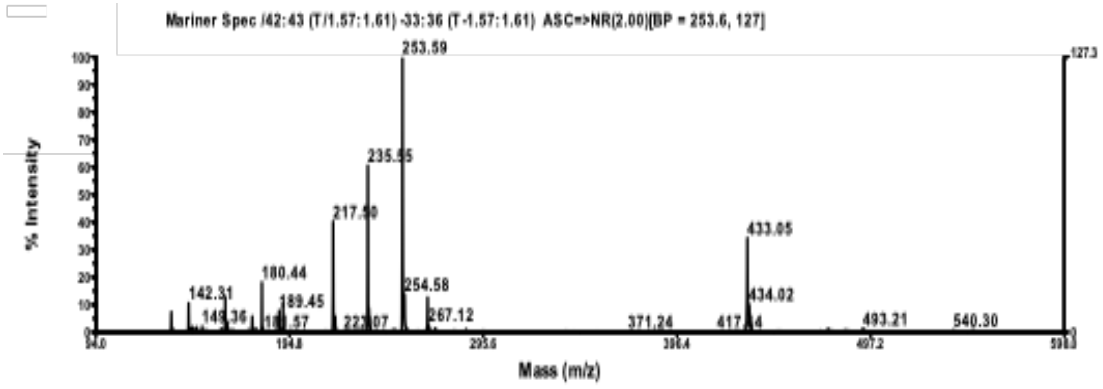

Figure 1. LCMS Test Chart

Identification of cork fish brownies compound added with cinnamon extract using LC-MS, bioactive detected in brownies from the two retention times produced was 7,3 - dihydroxyflavone.

7,3 - dihydroxyflavone is a bioactive compound that can function as an antioxidant, as explained in the study (Bylka et al., 2004) states that dihydroxyflavone is a derivative of flavonoids that can be antioxidants well. Dihydroxyflavone itself is able to inhibit gram-negative bacteria. Bacteria can be inhibited by compounds that have hydroxyl groups in ring B (myricetin> luteolin> quercetin> kaempferol) or with prenylated flavanones. Flavonoids are natural compounds found to be active against bacteria.

3.9 Texture Scoring

Based on the results of the analysis of diversity, it was shown that the different cinnamon concentrations significantly affected the scoring of the texture of cork fish brownies. Based on the results of the analysis of diversity, it was shown that the shelf life had a significant effect on the scoring of the texture of cork steamed fish brownies. Based on the results of analysis of diversity, it shows that the interaction between different concentration treatments and shelf life has a significant effect on the scoring of the texture of cork fish brownies. The highest texture scoring was obtained at 7.5% cinnamon concentration with a shelf life of 2 days with a value of 6.08%. The lowest score was at 0% cinnamon concentration with a shelf life of 6 days with a value of 2.93%. The longer the food product is left open, the quality of the product will decrease. According to (Purwaningsih et al., 2011), Decreasing the value of texture is related to microbial activity during storage which describes macromolecules primarily proteins into derivative products such as peptides and amino acids by producing water molecules (H2O). The decrease in water binding capacity by the ability of degraded proteins causes the texture to become soft.

3.10 Taste Scoring

Based on the results of the analysis of diversity, it was shown that the treatment of different cinnamon concentrations had a significant effect on the scoring of the taste of cork fish brownies. Based on the results of the analysis of diversity, it was shown that the treatment of shelf life had a significant effect on scoring the taste of cork fish brownies. Based on the results of the analysis of diversity, it was shown that the interaction of the treatment of the construction of different cinnamon and the length of shelf life significantly affected the scoring of the taste of cork fish brownies. The highest taste scoring was obtained at 2.5% cinnamon concentration with a shelf life of 0 days with a value of 6.75%. While the lowest taste score was obtained at 7.5% cinnamon concentration with a shelf life of 6 days with a value of 3.12%. This is thought to taste in brownies sourced from additional ingredients and the main ingredients in making brownies such as cinnamon which is too high. The longer the shelf life, the panelists' taste scores for biscuits also declined.

3.11 Aroma Scoring

Based on the results of analysis of diversity, it was shown that the treatment of different cinnamon concentrations significantly affected the scoring of the aroma of cork fish brownies. Based on the results of the analysis of diversity, it was shown that the shelf life did not significantly affect the scoring of the aroma of cork fish brownies. Based on the results of analysis of diversity, it was shown that the interaction of the treatment of different cinnamon concentrations and shelf life had a significant effect on scoring the aroma of cork fish brownies. The highest aroma scoring was found in the treatment of cork fish with a concentration of 7.5% with a shelf life of 0 days with a value of 6.22%. While the lowest aroma score was obtained at the concentration of 0% cinnamon with a shelf life of 4 days with a value of 4.67%. According to (Anggraini et al., 2015), that cinnamon has aromatic compounds, the aroma depends on the substance with different arrangements. The substances contained in cinnamon include sinnamaldehyde, eugenol, safrol or camphor, aceteugenol and a number of other aldehydes in small quantities. The sweet taste and certain odor of the dried bark of cinnamon are mainly determined by the volatile aromatic oil content in the stem

3.12 Hedonoik Texture

Based on the results of analysis of diversity, it was shown that the addition of different cinnamon concentrations significantly affected the hedonic texture of cork fish brownies. Based on the results of analysis of diversity, it was shown that the treatment of shelf life had a significant effect on the hedonic texture of cork fish brownies. Based on the results of analysis of diversity, it was shown that the interaction between different types of cinnamon concentration and shelf life did not significantly affect the hedonic texture of cork fish brownies. The highest texture hedonic was obtained by the addition of 7.5% cinnamon concentration with a shelf life of 0 days with a value of 6.61%. While the lowest hedonic texture is obtained by adding the concentration of cinnamon 0% with a shelf life of 6 days with a value of 3.55

3.13 Hedonic Taste

Based on the results of analysis of diversity, it was shown that the addition of different cinnamon concentrations significantly affected the hedonic taste of cork fish brownies. Based on the results of analysis of diversity, it was shown that the shelf life had a significant effect on the hedonic taste of cork fish brownies. Based on the results of analysis of diversity, it was shown that the interaction between the addition of different cinnamon concentrations and shelf life did not significantly affect the hedonic taste of cork fish brownies. The highest taste hedonic was obtained by adding 2.5% cinnamon concentration with a shelf life of 0 days with a value of 6.67%. Whereas the lowest hedonic taste was found in the addition of 7.5% cinnamon concentration with a shelf life of 6 days with a value of 3.76%.

3.14 Hedonic Aroma

Based on the results of analysis of diversity, it was shown that the addition of different cinnamon concentrations significantly affected the hedonic aroma of cork fish brownies. Based on the results of the analysis of diversity, it shows that the shelf life has a significant effect on the hedonic aroma of brownies. Based on the results of analysis of diversity, it shows that the interaction between the treatment of cinnamon concentration which is different from the shelf life does not significantly affect the hedonic aroma of cork fish brownies. The highest scent hedonic was obtained at the addition of 7.5% cinnamon concentration with a shelf life of 0 days with a value of 5.98%. While the lowest hedonic aroma was obtained in treatment (A1B3) cinnamon concentration of 0% at a 4-day shelf life with a value of 3.59%

IV. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The conclusions that can be given in this study are:
1. The use of different cinnamon concentrations is 0%, 2.5%, 5%, and 7.5% affect the fat content, FFA levels and TBA levels of cork steamed brownies.
2. Long shelf life treatment of 0 days, 2 days, 4 days and 6 days affected fat content, FFA levels, TBA levels of cork fish brownies.
3. The interaction treatment of the addition of cinnamon concentration which is different from the shelf life has an effect on FFA levels and TBA levels but has no effect on the fat content of cork fish brownies

4.2 Suggestions

Suggestions that can be given in the next study the researchers tested the microbial content in each treatment on cork fish brownies to produce quality cork fish brwonies products.

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